Resource Adequacy Staff Proposals Workshop

January 27, 2014

Donald Brooks | Jaime Gannon | Joanna Gubman

California Public Utilities Commission

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

Agenda

10:00 – 10:10	**Introductions and announcements**
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

Safety and emergency information

- In the event of an emergency, please calmly proceed out of the exits. There are four exits total. Two exits are in the rear and two exits are on either side of the public speakers area.
- If you use the back exit, please head out through the courtyard and down the front stairs across McAllister.
- If you use the side exits you will end up on Golden Gate Ave. Please proceed around the front of the building to Van Ness Ave and continue on down to the assembly point.
- Our assembly point is between the War Memorial Building and the Opera Building (House) on Van Ness Ave, between McAllister and Grove.

Workshop Logistics

- Remote participants may email questions to joanna.gubman@cpuc.ca.gov or submit questions via WebEx chat
- Teleconference: (866) 812-8481; Code: 9058288#
- Slides have been emailed to the following Service Lists: R.11-10-023 (RA), R.12-03-014 (LTPP), R.13-09-011 (DR), and R.10-12-007 (Storage)
- WebEx: https://van.webex.com/van/j.php?ED=235004447&UID=491292852&PW=NNTRkZDA5NWM4&RT=MiM0
  - Topic: R.11-10-023 – Resource Adequacy Staff Proposals
  - Meeting Number: 746 614 238
  - Meeting Password: resource

We will discuss RA staff proposals today & request formal comments by Feb 18

- Effective Load Carrying Capability for Wind and Solar Resources
- Qualifying Capacity and Effective Flexible Capacity for Storage and DR
- Proposed RA Program Refinements
- **Formal Comments due February 18 to donald.brooks@cpuc.ca.gov**

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources**
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources** ➢ Introduction ➢ Effective Load Carrying Capability Framework ➢ Effective Load Carrying Capability Calculation ➢ Qualifying Capacity Calculation ➢ Literature Review
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources** ➢ **Introduction** ➢ Effective Load Carrying Capability Framework ➢ Effective Load Carrying Capability Calculation ➢ Qualifying Capacity Calculation ➢ Literature Review
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

ELCC is a usefulness-based rating of a resource's system reliability benefit

Location & Transmission Constraints

Existing Generation Fleet

Resource Availability
- Time of day
- Weather

Expected Load

Nameplate MW

Contribution to System Reliability

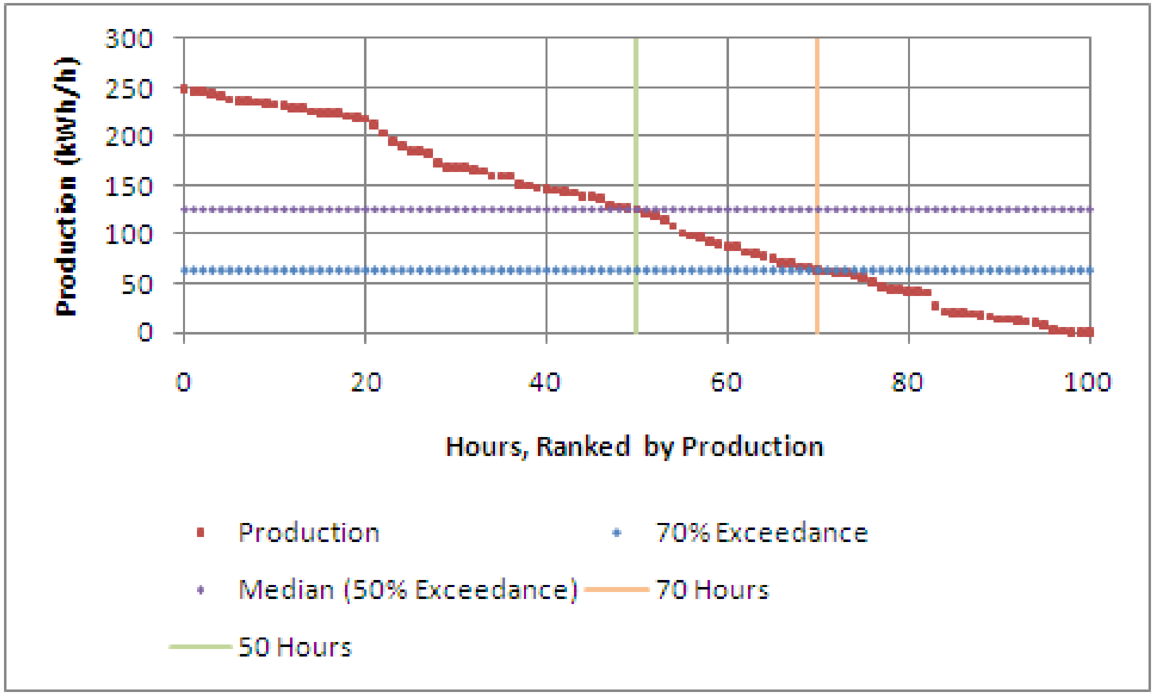
Forecasting Uncertainty
- Weather, Economic
- Resource performance

ELCC is a percentage: a derating factor from nameplate to qualifying capacity

- ELCC is a metric that is an output of probabilistic modeling of the electricity system
- QC = ELCC [%] * Nameplate Capacity [MW]
  - Qualifying capacity (QC) is the amount of capacity that can be counted towards meeting resource adequacy requirements
  - Every RA-eligible facility is assigned a QC
  - QC is subject to deliverability constraints (NQC)

ELCC is an alternative to the current exceedance methodology for QC

Exceedance ranks the facility's production from highest to lowest then determines the value exceeded 70% of the time



Why use ELCC to determine the QC of wind and solar resources?

- Mandated by the legislature for wind and solar in SB 2 (1X)
- More accurately represents likely conditions than current exceedance methodology
- Reflective of wind and solar value to the system as a whole not just comparing individual facility against a standard
- Will provide guidance going forward as to what types of resources & design choices may be most useful to the system

Qualifying capacity & ELCC calculations for supply-side wind/solar are in scope

In Scope

- Solar PV that is not behind the meter
- Solar thermal that is not behind the meter
- Wind
- Effective Load Carrying Capability (ELCC) calculation methodology
- ELCC-based calculation of qualifying capacity (QC)

Not In Scope

- Behind the meter solar PV, solar thermal, or wind
- Co-located storage
- QC of other resource types (storage, demand response, or conventional resources)
- Flexibility, Flexible RA, or Effective Flexible Capacity
- Deliverability or Net Qualifying Capacity
- RA eligibility requirements

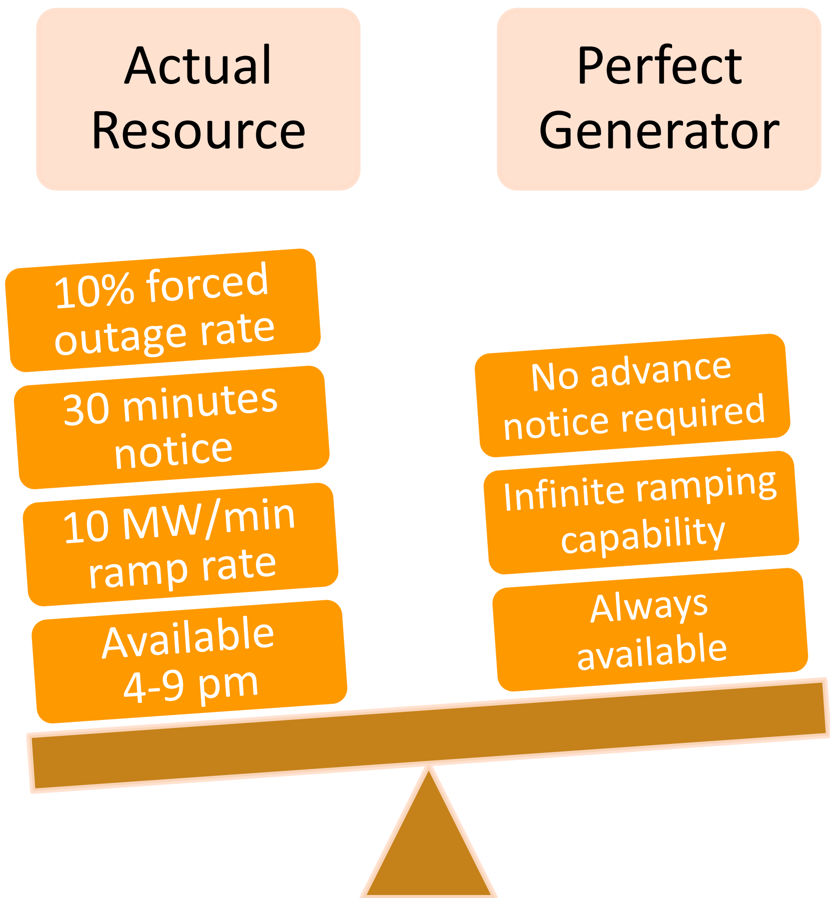
Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources** ➢ Introduction ➢ **Effective Load Carrying Capability Framework** ➢ Effective Load Carrying Capability Calculation ➢ Qualifying Capacity Calculation ➢ Literature Review
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

There are three ways to calculate ELCC; we use the "perfect generator" method

- ✗ ELCC as how much load can be increased in order to cancel out the reliability benefit of including a given resource (or resource type)
  - Historical approach; yields an ELCC that is expressed in MW
- ✗ ELCC as the MW capacity of a conventional resource needed to provide the same reliability benefit as a MW of the actual resource type
  - Yields an ELCC that is expressed in percentage
- ✓ ELCC is the capacity of idealized, perfect generation needed to provide the same reliability benefit as a MW of the actual resource type

A resource's ELCC express its system usefulness relative to a perfect generator



Perfect Generator Characteristics

- No transmission constraints
  - Modeled in its own region, with unlimited transmission capacity to all regions
- Immediate start-up and shut-down
- Infinite ramping capability
- No use limitations
- No outages
- Positive generation only
  - No charging or other load

The perfect generator approach has theoretical and practical advantages

- Quantifies actual contribution to meeting system reliability needs, not contribution relative to that of conventional generation
- Avoid dependence on conventional generator or load assumptions
- If other resources receive an ELCC in future years, they can easily be compared to the same perfect generator and to one another
- Conventional resources have their own deratings
  - QC is reduced from maximum output to “dependable” capacity
  - Transmission constraints for all resources are taken into account via deliverability calculations (NQC process)
- Difference in ELCC outcome is typically relatively small compared to other factors such as annual weather variation (5-10% according to a 2010 NREL/GE study, vs. ± 10% from annual weather)[1]

[1] Western Wind and Solar Integration Study, NREL/GE, May 2010.

ED is conducting ELCC modeling using the SERVM reliability calculator

- SERVM: Strategic Energy Risk Valuation Model
- Probabilistic model of the WECC system
  - 8 California regions (4 CAISO areas), 10 bordering states/countries
  - Every facility is modeled individually (except hydropower), considering maximum and minimum capacity, use limitations, etc.
- Main data sources:
  - CAISO MasterFile (where possible) and TEPPC Common Case 2022 dataset (outside of CAISO)
  - Load inputs and fuel price forecasting from the CEC
  - Several inputs (such as outage rates and DR prices) sourced from CAISO 2012 LTPP modeling
- Developed by Astrape Consulting, licensed by ED, installed on CPUC servers, populated and run by ED staff

SERVM models consecutive hours and days based on historical data

- Future study year is modeled based on thousands of probabilistic runs
- Each run is based on a randomly drawn historical weather year, the anticipated generation fleet, forecasted load, and expected uncertainty
- Runs are modeled with 8760 continuous hours, and intra-hour (5-minute) volatility
- Outputs numerous system reliability metrics, including Loss of Load Expectancy (LOLE)

ELCC is based on the monthly Loss of Load Expectation (LOLE)

- A monthly LOLE is the percentage of time in that month during which system capacity is unable to meet CAISO system load
  - This is a system-wide metric; any firm load shedding anywhere in the system counts
  - Inability to meet demand may nevertheless be regional, due to transmission constraints
  - Example: If load shedding occurs for ten out of 744 hours, then the system LOLE for that month is equal to 10/744 = 0.013 (1.3%).
- If two scenarios yield the same LOLE for a given month, then they are considered to have the same reliability level in that month, regardless of their generation portfolios
- ED will evaluate ELCC for wind and solar resources periodically (every 1-2 years) as conditions change

Should ELCC reflect reliability impacts across all 8,760 hours of the year?

- Reliability events can occur at any time, so we propose to consider all hours of the year
- Conventional resources are only required to be available during standard Availability Assessment Hours; the ELCC calculation could be limited to impacts during these hours
- Alternatively, the higher of the two options could be selected

A single ELCC value will be assigned to groups of similar facilities & regions

Eight California Regions

- Balancing Authority of Northern California (SMUD)
- IID (Imperial Irrigation District) Service Territory
- LADWP Balancing Authority Area
- PG&E Bay Area (Greater Bay Area Local Capacity Area)
- PG&E Valley (Other PG&E Local Capacity Areas)
- SCE TAC Area
- SDG&E Service Territory
- TID (Turlock Irrigation District) BAA

Ten External Regions

- Arizona
- Canada
- Colorado
- Mexico
- Montana
- Nevada
- New Mexico
- Pacific Northwest
- Utah
- Wyoming

A single ELCC value will be assigned to groups of similar facilities & regions

Two Wind Categories	Three Solar Categories
• We look forward to parties' feedback on the following options: – Above/below 70 meters – Above/below 1.5 MW – Before/after 2006 – Other?	• Photovoltaic: Fixed Tilt • Photovoltaic: Tracking • Solar Thermal

18 Regions x 5 Technology Types x 12 Months = 1,080 distinct ELCC values each year

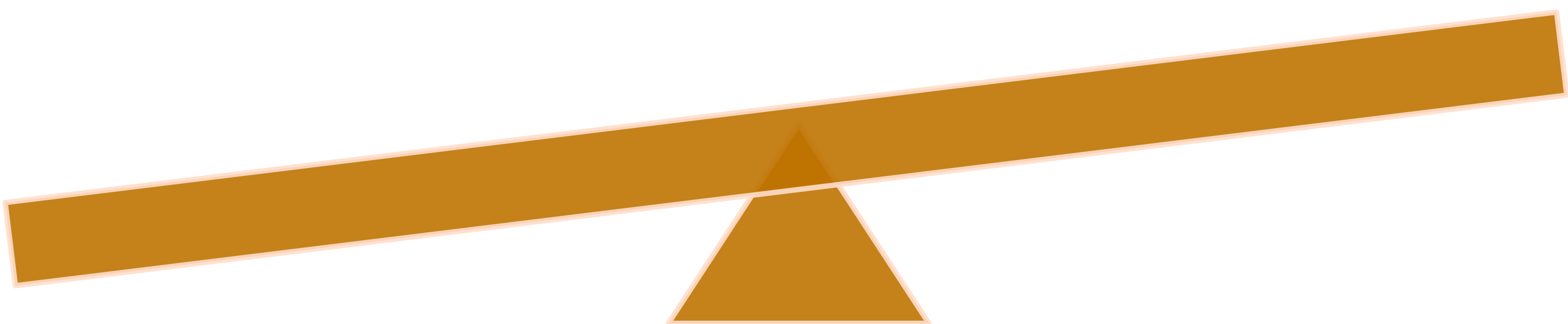
Aggregating ELCC values is advisable for theoretical and practical reasons

- Computational and administrative simplicity: 1,080 ELCC values per year is already a lot
  - Predictability and ease of market analysis for market participants
- Technical challenges
  - Modeling the impact of a single small facility
  - Facility-specific generation profiles (also likely controversial)
- Individual modeling will either over- or under-count the overall reliability benefit from a given group, or give higher value to facilities that happen to have been built earlier
  - The first MW has more reliability benefit than the last marginal MW, but because facilities generate simultaneously, equity concerns prohibit differentiating between vintage of installation for equivalent technology

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources** ➢ Introduction ➢ Effective Load Carrying Capability Framework ➢ **Effective Load Carrying Capability Calculation** ➢ Qualifying Capacity Calculation ➢ Literature Review
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

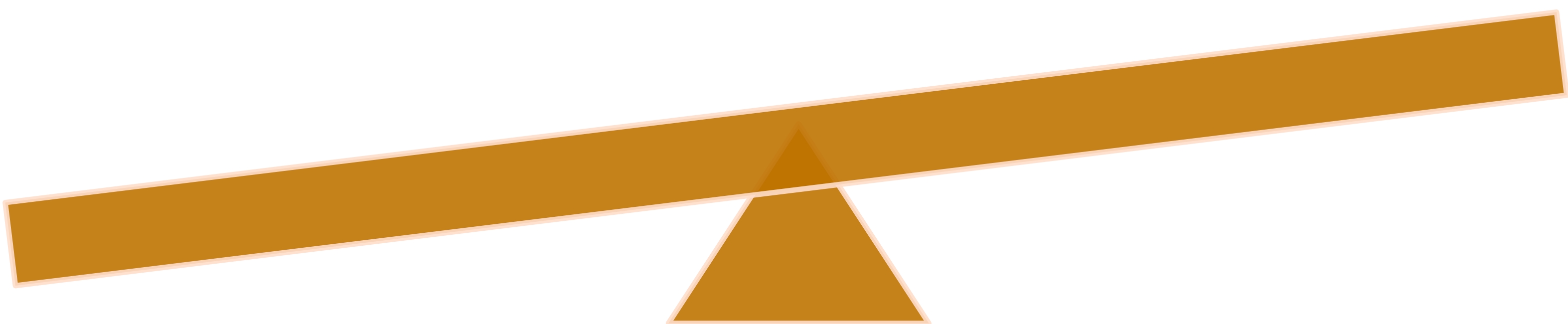
ELCC = Perfect MW / Resource MW



ELCC = Perfect MW / Resource MW

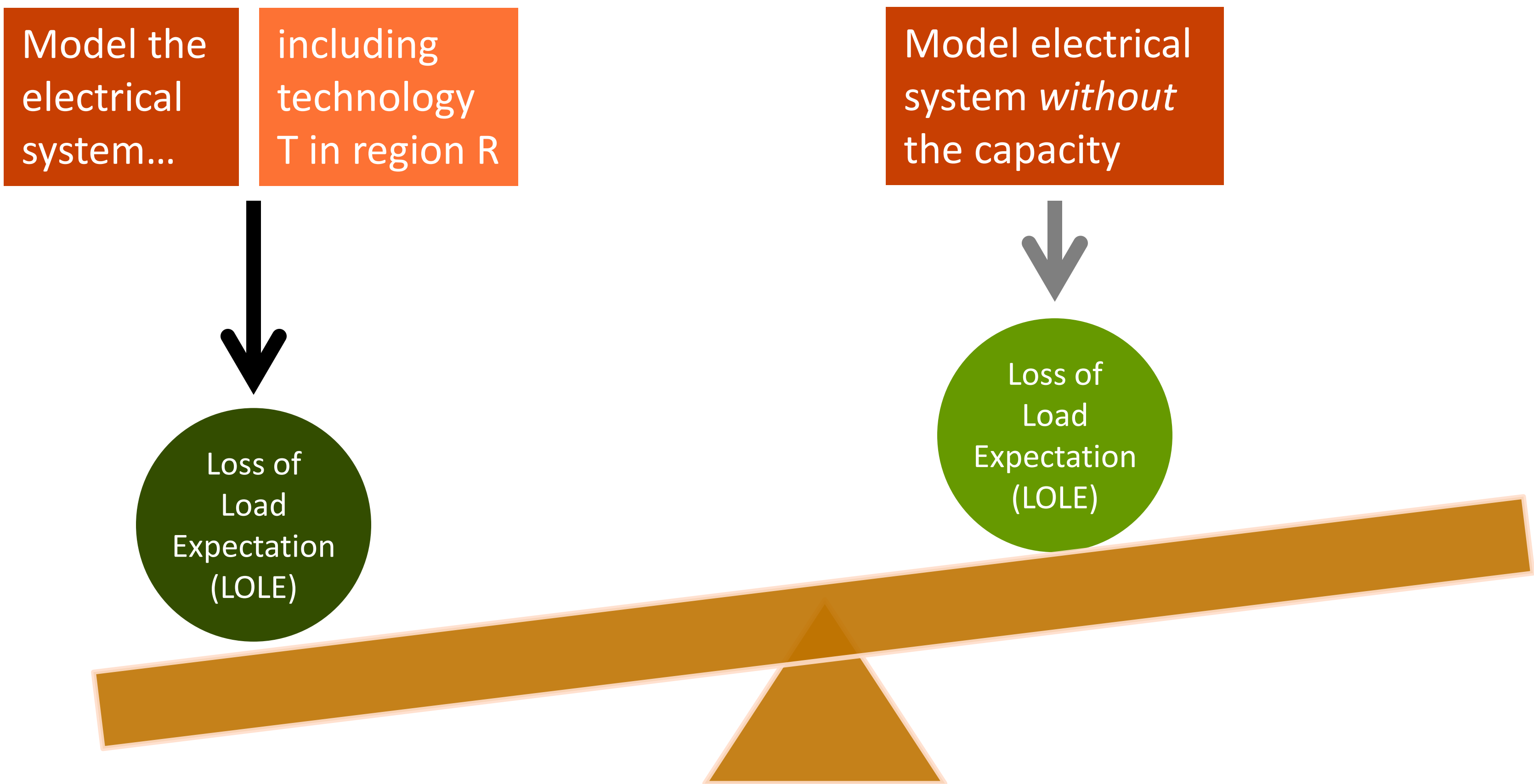
Model the electrical system…

including technology T in region R

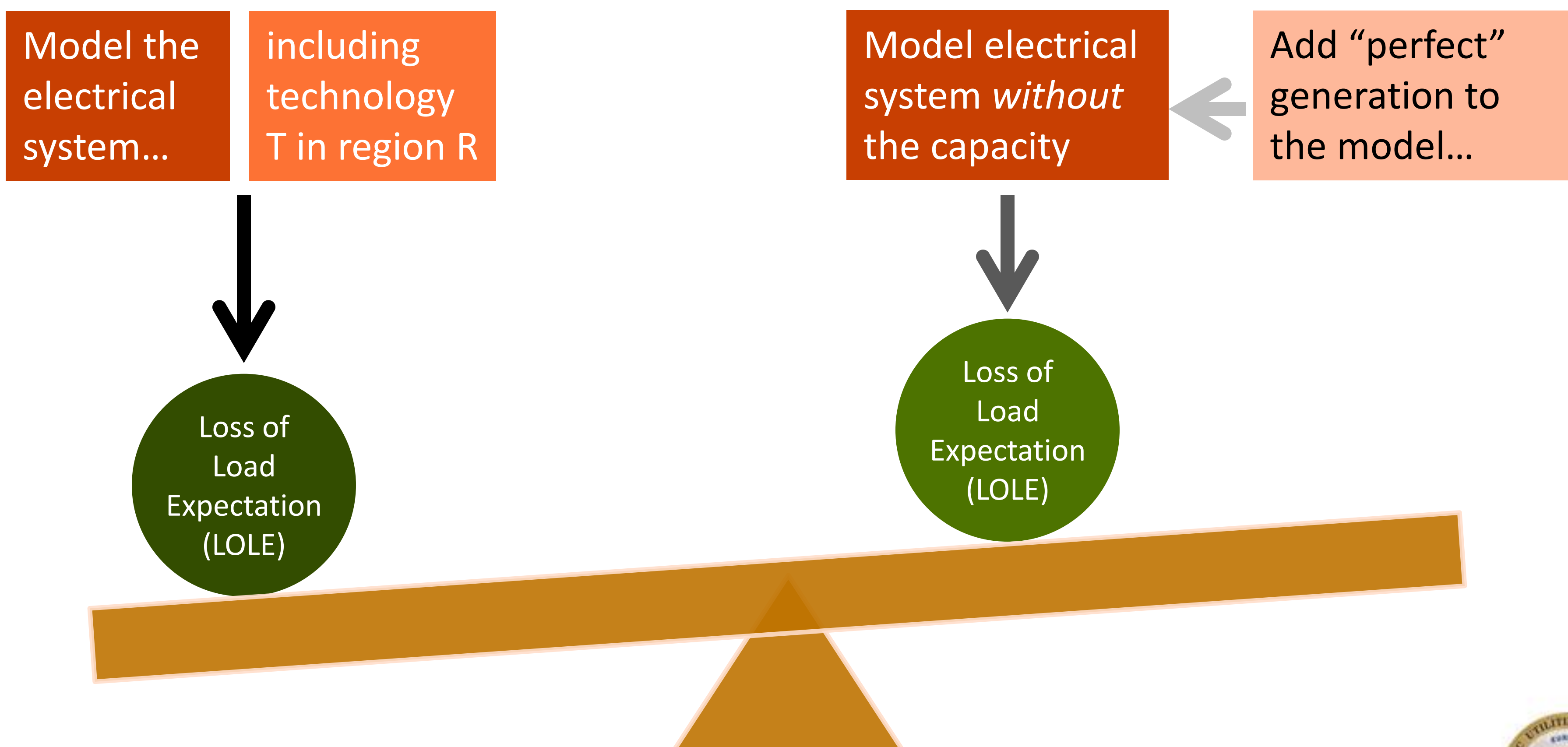


ELCC = Perfect MW / Resource MW

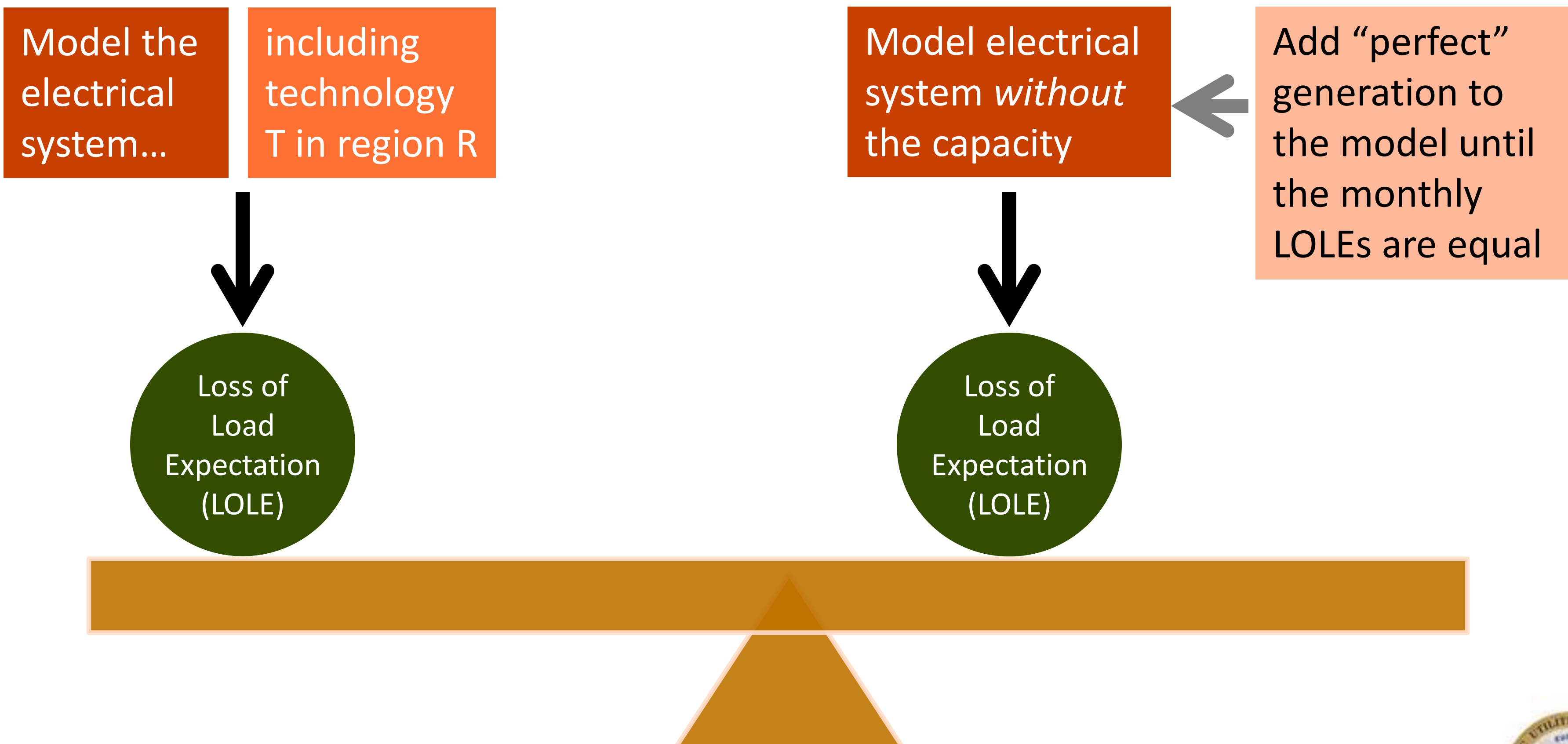
ELCC = Perfect MW / Resource MW



ELCC = Perfect MW / Resource MW

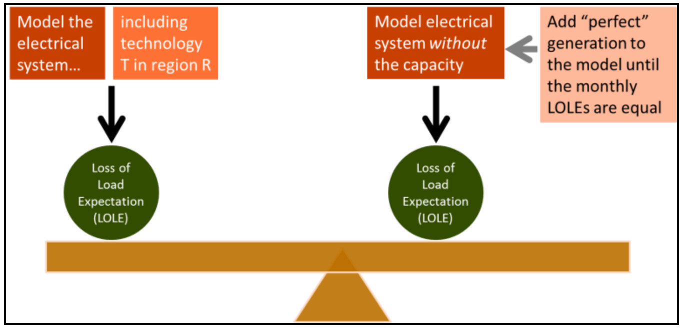


ELCC = Perfect MW / Resource MW



ELCC = Perfect MW / Resource MW

$$\text{ELCC} = \frac{\text{Perfect MW Added}}{\text{Capacity of T in R (MW)}}$$



The Capacity of T in R is the sum of the nameplate capacities of all resources of technology type T that are located in region R.

Completely Made-Up Example: 1000 MW fixed tilt PV, SCE region, May

1. System LOLE for May is 0.001, including all resources
2. System LOLE for May rises to 0.002 if the 1000 MW in the SCE region are excluded
3. 250 MW of perfect generation is required to return the May LOLE to 0.001
4. May ELCC for fixed tilt PV in the SCE region: 250 MW ÷ 1000 MW = 25%

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources** ➢ Introduction ➢ Effective Load Carrying Capability Framework ➢ Effective Load Carrying Capability Calculation ➢ **Qualifying Capacity Calculation** ➢ Literature Review
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

Qualifying Capacity (QC) is equal to a resource's MW derated by its ELCC

QC = Resource Nameplate Capacity [MW] x ELCC [%]

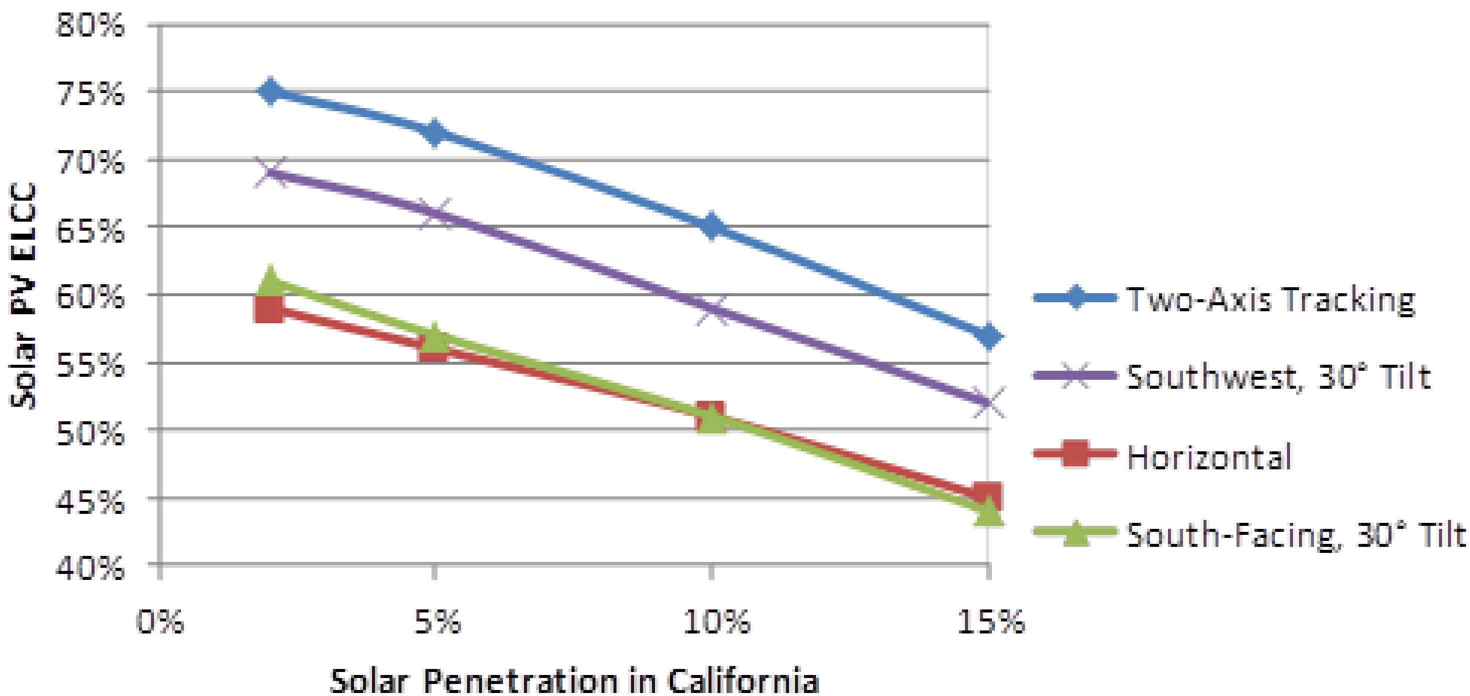
Qualifying Capacity (QC) is equal to a resource's MW derated by its ELCC

$$QC = P_{max}\ [MW] \times ELCC\ [\%]$$

Agenda

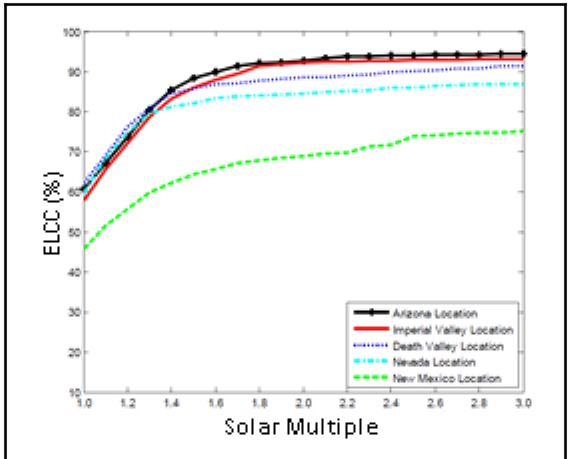
10:00 – 10:10	Introductions and announcements
10:10 – 11:20	**Effective Load Carrying Capability for Wind and Solar Resources** ➢ Introduction ➢ Effective Load Carrying Capability Framework ➢ Effective Load Carrying Capability Calculation ➢ Qualifying Capacity Calculation ➢ **Literature Review**
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	Proposed RA Program Refinements

Increasing solar penetration reduces ELCC; orientation and tracking matter

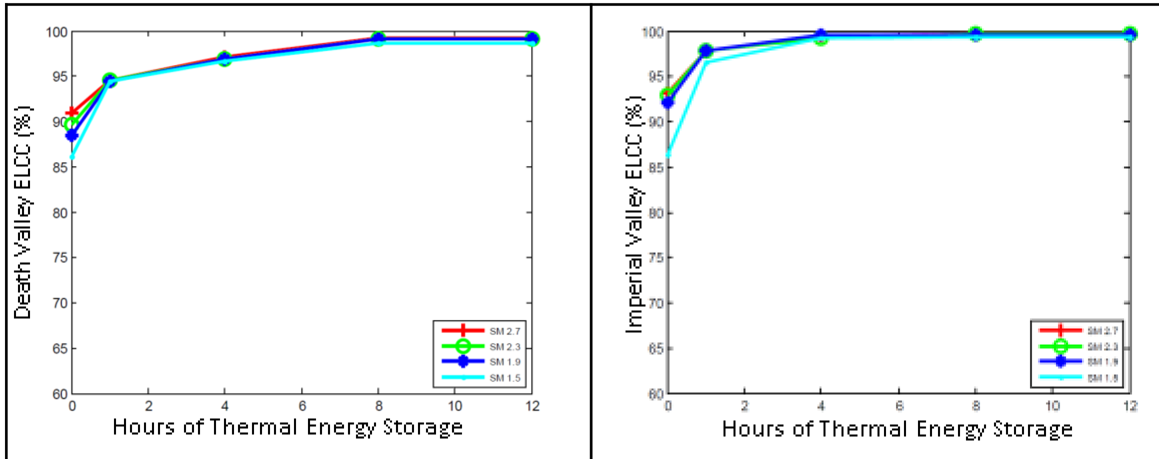


Source: *Update: Effective Load-Carrying Capability of Photovoltaics in the United States*, NREL, 2006. http://www.nrel.gov/docs/fy06osti/40068.pdf.

Concentrating solar power (CSP) ELCCs depend on solar multiple and storage



Average ELCCs of CSP plants without storage



ELCC of concentrating solar power with thermal energy storage in Death Valley and Imperial Valley

Source: *Capacity Value of Concentrating Solar Power Plants*, NREL, 2011. Data from 1998-2005. Charts are from the “energy and capacity market” scenario, because that scenario incorporates more reliability-oriented dispatch optimization than the energy-only scenario. http://www.nrel.gov/docs/fy11osti/51253.pdf.

Another study: Western Wind & Solar Integration Study (NREL/GE Energy)

- Wind: ELCC of 10-15%, for 10-30% penetration
- Solar PV: ELCC of 25-30%, at 1-5% penetration
- CSP with 6 hours of thermal energy storage: 90-95% at 1-5% penetration
- Covers AZ, CO, NV, NM, and WY.

Source: *Western Wind and Solar Integration Study*, prepared for NREL by GE Energy, 2010. Note that the recommended approach is referred to as "capacity value" in that document, while the term ELCC is used exclusively to refer to the load-increasing approach. http://www.nrel.gov/docs/fy10osti/47434.pdf.

We encourage parties to review the numerous studies on wind/solar ELCC

- *Methods to Model and Calculate Capacity Contributions of Variable Generation for Resource Adequacy Planning*, NERC, 2011. http://www.nerc.com/docs/pc/ivgtf/IVGTF1-2.pdf
- *Summary of Time Period-Based and Other Approximation Methods for Determining the Capacity Value of Wind and Solar in the United States*, NREL, 2012. http://www.nrel.gov/docs/fy12osti/54338.pdf
- *Capacity Value of Wind Power*, NERC, 2011. http://www.nerc.com/docs/pc/ivgtf/ieee-capacity-value-task-force-confidential%20(2).pdf
- *California Renewables Portfolio Standard Renewable Generation Integration Cost Analysis*, the California Wind Energy Collaborative, NREL, Oak Ridge National Laboratory (ORNL) and Dynamic Design Engineering, 2006. http://www.energy.ca.gov/2006publications/CEC-500-2006-064/CEC-500-2006-064.PDF
- Additional studies and some of their results are listed in the Staff Proposal

Source: *Western Wind and Solar Integration Study*, prepared for NREL by GE Energy, 2010. Note that the recommended approach is referred to as "capacity value" in that document, while the term ELCC is used exclusively to refer to the load-increasing approach. http://www.nrel.gov/docs/fy10osti/47434.pdf.

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	**Qualifying Capacity and Effective Flexible Capacity for Storage and DR**
12:20 – 2:00	Proposed RA Program Refinements

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	**Qualifying Capacity and Effective Flexible Capacity for Storage and DR** ➢ **Introduction** ➢ RA Eligibility ➢ Testing and Verification ➢ QC and EFC Methodologies ➢ Recommendations for Future Years
12:20 – 2:00	Proposed RA Program Refinements

Storage and supply-side DR require QC & EFC values to count as RA resources

- QC: Qualifying Capacity [MW]
  - Contribution towards meeting peak load needs
  - Counts towards LSE System or Local RA obligations
- EFC: Effective Flexible Capacity [MW]
  - Contribution towards meeting system ramping needs
  - Counts towards LSE Flexible RA obligations

Only supply-side demand response and energy storage are in scope

Demand Response (DR)	Energy Storage (ES)
• May be supplied by any DR provider (DRP), whether IOU or third party • Must participate in CAISO markets and be subject to a must-offer obligation (MOO)	• Must participate in CAISO markets and be subject to a must-offer obligation (MOO) – Stand-alone – Distributed peakers – Customer-sited, with market participation – Co-located with DR or generation resources

Load-modifying and other storage or demand response are not within scope

Demand Response (DR)	Energy Storage (ES)
• Customer-focused programs and rates – Example: Critical peak pricing • Emergency reliability programs not bidding into CAISO markets • Typically IOU-operated • Need not participate in any markets	• Voltage support applications • Substation energy storage • Community energy storage • Customer-sited storage without full market participation

Deliverability, which yields net qualifying capacity, is also not in scope

- Deliverability calculations determine the impact of transmission constraints that could prevent a resource’s full QC from being deliverable to load
  - QC is an input to deliverability calculations
  - The deliverable capacity is called the net qualifying capacity (NQC)
- NQC is calculated by the CAISO and adopted by the CPUC

Agenda

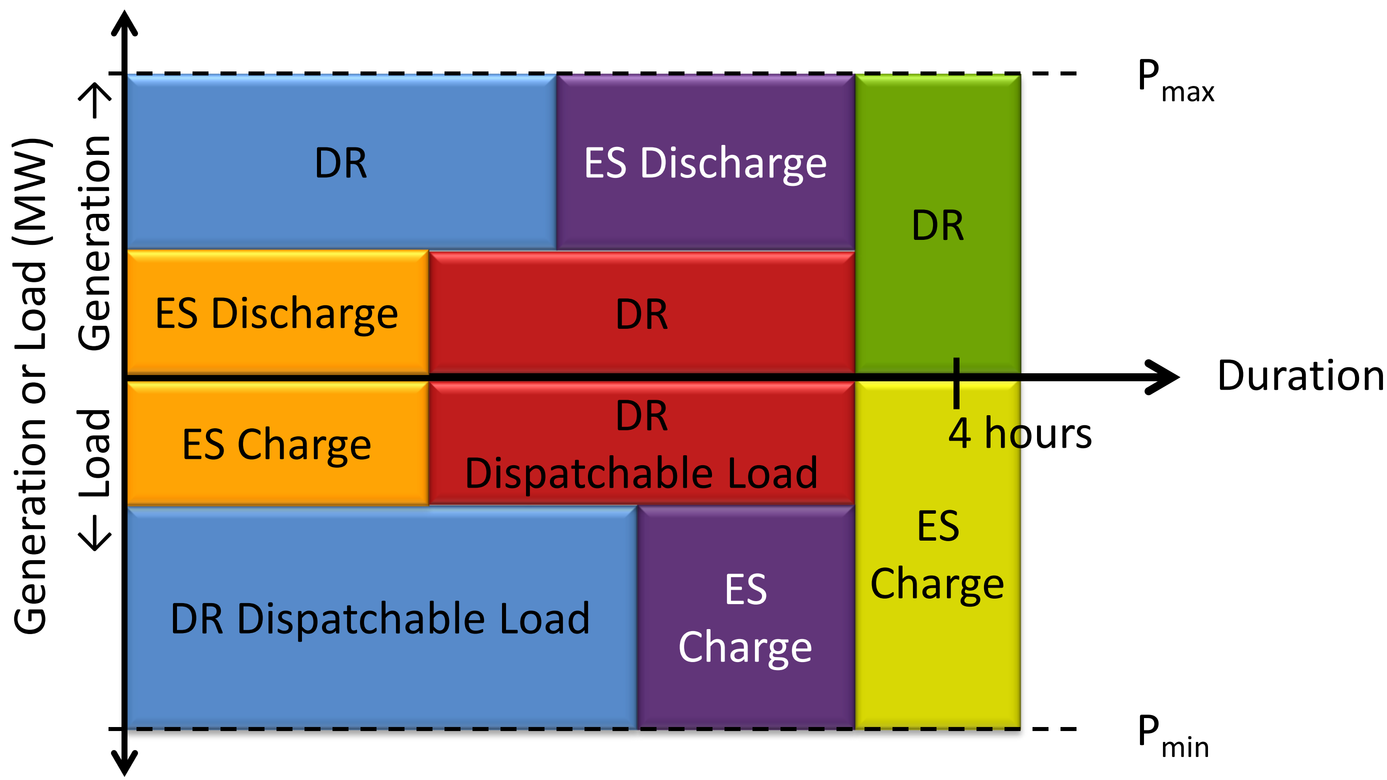
10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	**Qualifying Capacity and Effective Flexible Capacity for Storage and DR** ➢ Introduction ➢ **RA Eligibility** ➢ Testing and Verification ➢ QC and EFC Methodologies ➢ Recommendations for Future Years
12:20 – 2:00	Proposed RA Program Refinements

ES and DR should meet existing and planned RA & CAISO eligibility criteria

System RA	Local RA	Flexible RA
• At least 4-hour duration for P_{max} (in aggregate) • Ability to operate over three consecutive days • Must-offer obligation (MOO): may either bid into CAISO or self-schedule	• At least 4-hour duration for P_{max} (in aggregate) • Ability to operate over three consecutive days • Must-offer obligation (MOO): may either bid into CAISO or self-schedule	• Ability to ramp or sustain output for at least three hours (in aggregate) • Flexible RA criteria and must-offer obligation (FRAC-MOO): must bid into CAISO markets as specified by the CAISO

Co-located storage operating in conjunction with a larger resource need not meet the above requirements; the RA qualification of the primary generating facility is sufficient

Storage and DR programs may be aggregated to meet RA requirements



Rules should be flexible yet still aligned with RA and CAISO goals & constraints

- Resources in the same sub-LAP may be aggregated for System/Flexible RA
- Local RA resources can only be aggregated if at the same sub-LAP or custom LAP and in the same Local Capacity Area
- Aggregated resources will receive a single Resource ID
  - If one element is charging or rebounding while another is discharging or curtailing, the impacts cancel one another out
  - Resources may provide performance data from a single aggregation point and need not report individual element performance in real time; this data must be made available for testing and auditing purposes, however
- Use limitations, such as hours of availability, must be taken into account
- Aggregated resources can be storage only, DR only, or storage + DR
- The aggregated resource as a whole must demonstrate eligibility
  - Operators may request a QC or EFC that is below maximum capability, to account for anticipated underperformance in a percentage of the portfolio

Dispatchable charging/load (P_{min} < 0) should count towards EFC but not QC

- These operational modes do not help meet peak needs (addressed via System/Local RA), but can meet ramping needs, so they should count towards Flexible RA obligations
- This will result in EFC > QC
  - Necessitates revision to current rule of EFC ≤ NQC
  - Recommended: EFC ≤ Maximum(NQC, NQC – P_{min})

The P_{min} eligible to count for EFC should reflect operational modes

Positive Output (Generation) Only	Positive *and* Negative Operating Ranges	Negative Output (Charging/Load) Only
• Minimum operating level sustainable over 3 hours (MW) • May be zero	• Operating level at which the facility can charge (or increase load) for 1.5 hours or more • Assumes facility can operate at P_{min} for the first half of the three-hour ramp, and at P_{max} for the second half	• Largest magnitude of charging (or load) sustainable for the full three hour ramp required for Flexible RA resources

Like P_{max}, negative P_{min} should be subject to transmission constraints if and when the CAISO develops deliverability assessments for that case.

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	**Qualifying Capacity and Effective Flexible Capacity for Storage and DR** ➢ Introduction ➢ RA Eligibility ➢ **Testing and Verification** ➢ QC and EFC Methodologies ➢ Recommendations for Future Years
12:20 – 2:00	Proposed RA Program Refinements

Energy storage must be tested to fully demonstrate RA eligibility

- Storage operators must submit test data to the CAISO showing performance at P_{max} and P_{min} over the full durations required for their RA eligibility
  - Co-located storage need not meet this requirement
  - Individual units may be aggregated to meet eligibility criteria
- Other physical/operating characteristics must also be submitted (similar to MasterFile data for conventional resources), such as efficiency and available energy

DR P_{max} & P_{min} will be based on testing, dispatches, and Load Impact Protocols

Test Duration & Timing	Two hours. Month selected by operator. Time & date selected by CAISO for Flexible RA, or by operator for System/Local RA.
Test Participants	A representative sample, or all participants
Initial Processing and Adjustment	The Load Impact Protocols already in use for Retail DR will continue to be used to determine P_{max}, the maximum resource potential (1 in 10); they will also be used to determine P_{min}. Adjustments will consider temperature, time of year, and other relevant factors.
Submission and Certification	Test data and Load Impact Reports will be submitted to the CAISO; adjustments will be conducted by the CPUC in approving the resource's P_{max} and P_{min}
Ongoing Adjustment (due to participant turnover and commitment modifications)	If the contracted MW changes from one year to the next, the DR provider must inform the CAISO; P_{max} and P_{min} will be revised by the CPUC, utilizing the Load Impact Protocols
Ongoing Testing	If a resource is not called for an entire year, it must be retested

Storage and DR must submit operating parameters for the CAISO MasterFile

- Similar to conventional resources, storage and DR operators must submit basic operating information to the CAISO
  - Startup time
  - Ramp rates (may vary over operating range)
  - Shutdown time
  - Etc.

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	**Qualifying Capacity and Effective Flexible Capacity for Storage and DR** ➢ Introduction ➢ RA Eligibility ➢ Testing and Verification ➢ **QC and EFC Methodologies** ➢ Recommendations for Future Years
12:20 – 2:00	Proposed RA Program Refinements

QC should be based on the P_{max} found via testing/load impact protocols

- The QC for storage facilities should be equal to the P_{max} determined via testing
- The QC for supply-side demand response facilities should be equal to the P_{max} determined via load impact protocols (based on testing and/or historical dispatch, and adjusted by the CPUC)
- Aggregated resources should receive a single QC for the combined resource
- Co-located storage should not receive a separate QC (unless it is being independently operated), but rather should modify the QC of the primary facility, as determined in the rules for that facility type
- QC values are subject to the standard CAISO deliverability tests, which yield NQC

Facilities may submit a higher short term output to CAISO for dispatch only

- Because P_{max} is based on a four-hour duration, storage resources in particular may be capable of much higher output levels over shorter durations
- While maximum rated output and duration thereof may be submitted to the CAISO, that output cannot be considered in RA credit determinations (i.e., it is energy-only)

Flexible RA must still qualify as System RA, and it must use the same P_{max}

- EFC may be greater than QC, but they remain based on the same P_{max}
- Flexible and System RA are still considered to be “bundled”
- Aggregated and co-located facilities should not receive separate EFCs (just as they do not receive separate QCs)

EFC should be calculated using the standard formula, modified for $P_{min} < 0$

- EFC = Minimum of (NQC – Pmin) and (180 minutes * Average Ramp Rate)
  - For start-up time (SUT) > 90 minutes *or* $P_{min} \leq 0$

- EFC = Minimum of (NQC) and (Pmin + (180 minutes – SUT) * Average Ramp Rate)
  - For all other resources (SUT < 90 minutes *and* $P_{min} > 0$)

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	**Qualifying Capacity and Effective Flexible Capacity for Storage and DR** ➢ Introduction ➢ RA Eligibility ➢ Testing and Verification ➢ QC and EFC Methodologies ➢ **Recommendations for Future Years**
12:20 – 2:00	Proposed RA Program Refinements

QC and EFC methodologies may be reconsidered in the future

- The CAISO FRAC-MOO Straw Proposal may have implications for the proposed QC and EFC calculation methodologies; this can be evaluated once a final proposal is adopted by the Federal Energy Regulatory Commission
- QC and EFC should ultimately be based on probabilistic ELCC modeling, as described earlier for wind and solar resources

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	**Proposed RA Program Refinements**

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	**Proposed RA Program Refinements** ➢ **RA Benefits for CAM and CHP resources outside of Service Areas** ➢ Schedule Outage Replacement Rule and SCP for CAM and CHP ➢ Allocating Flexible Capacity Associated with CAM Resources ➢ Local RA Proposals

RA Benefits for CAM and CHP Resources Procured Outside of the IOUs' TAC Areas

Background:

- D.06-07-029 of the LTPP adopted a process known as the Cost Allocation Mechanism (CAM). CAM allows the IOUs to allocate the capacity costs and benefits of certain new generation resources to all benefiting customers within their TAC areas.
- Parallel to the CAM process, the QF/CHP settlement, adopted in D.10-12-035, established a cost allocation mechanism to be used to share the benefits and costs associated with meeting the CHP and GHG goals. This cost allocation mechanism is almost identical to what was adopted in the LTPP decision for CAM resources, except that the mechanism does not require that the CHP facility be located in the IOUs' service territory.

RA Benefits for CAM and CHP Resources Procured Outside of the IOUs’ TAC Areas

Allocating RA credit to LSEs in one TAC area for resources procured in another TAC area can be problematic for the following reasons:

1) It does not consider the Path-26 system constraint
2) Local costs are not equitably allocated, in that customers in one TAC area (that of the IOU conducting the RFP) are paying for reliability benefits in another area (the TAC area in which the CHP is located)
3) It creates another level of complexity in procurement planning that is not transparent to LSEs that serve DA and CCA load

RA Benefits for CAM and CHP Resources Procured Outside of the IOUs' TAC Areas

Staff Proposal:

- Staff proposes to limit the RA capacity benefits of the CAM to those resources that are procured in the same TAC area as the purchasing IOU. The same would hold for resources procured via mechanisms similar to CAM.

RA Benefits for CAM and CHP Resources Procured Outside of the IOUs' TAC Areas

- This proposal does not propose any cost allocation change to what was adopted in the QF/CHP settlement.
- This proposal does propose that no RA value/benefit be given for procurement outside an IOUs TAC area.
- This proposal should impact, in future RFO's, the valuation of resource bids that are located outside an IOUs' TAC area.

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	**Proposed RA Program Refinements** ➢ RA Benefits for CAM and CHP resources outside of Service Areas ➢ **Schedule Outage Replacement Rule and SCP for CAM and CHP** ➢ Allocating Flexible Capacity Associated with CAM Resources ➢ Local RA Proposals

Schedule Outage Replacement Rule and Standard Capacity Product (SCP) Mechanisms for CAM and CHP Resources

Background:

- D.11-06-022 eliminated the CPUC administered scheduled outage replacement rule beginning with the 2013 RA compliance year. The CPUC's replacement rule was superseded by the ISO's scheduled outage replacement rule in January 2013.
- Currently the replacement obligation falls on the LSE if the outage is scheduled at least 45 days prior to the compliance month. LSEs have the option to manage their scheduled outages through their RA plans.
- Currently CAM and CHP resources are treated as an allocated credit towards each LSEs RA requirement. These resources are not submitted on an RA plan and therefore, by default, are not subject to the ISO's scheduled outage replacement rule.

Schedule Outage Replacement Rule and Standard Capacity Product (SCP) Mechanisms for CAM and CHP Resources

- The ISO has established a Standard Capacity Product (SCP) mechanism that penalizes the scheduling coordinators (SCs) of RA resources that are on forced outage when the RA resource is needed for system reliability.
- SCs of CAM and CHP resources have no ability to manage the associated SCP penalty risks.
- Without the flexibility to manage the forced outages of the CAM and CHP resources, the SCs could incur penalties that are potentially avoidable. These penalty costs are shared by all distribution customers.

Schedule Outage Replacement Rule and Standard Capacity Product (SCP) Mechanisms for CAM and CHP Resources

Staff Proposal:

- Staff proposes that the IOU procuring the CAM or CHP resource be given the flexibility to manage the resource for planned and forced outages, in order to avoid or minimize the costs associated with replacement and standard capacity penalty mechanisms.
- The IOU will be given the authority to recover any replacement costs through a balancing account mechanism. Staff proposes that the authorized IOU use the following resource types to replace capacity due to a forced outage or scheduled outage (in the order specified):
  1. Resources that are managed by the IOU via tolling agreements or utility ownership. The costs associated with this replacement will have to be determined.
  2. Resources that the IOU needs to procure specifically for purposes of replacement, and which increase costs to the utility exceeding simple operation of the resources discussed above.

Schedule Outage Replacement Rule and Standard Capacity Product (SCP) Mechanisms for CAM and CHP Resources

- To implement this proposal, staff would change the allocation of RA credits associated with CAM and CHP resources.
- For ESPs and CCAs no changes would occur -- CAM credits would continue to be allocated in the current manner.
- The allocation method would change for the IOUs -- they would no longer be given a CAM system credit and local RAR reduction, but would be given a CAM system debit and no CAM local RAR reduction. The system CAM debit (meaning addition to the utility's RA obligation) will be equal to the amount of CAM credits provided to non-utility LSEs serving load in each TAC area.
- The IOUs responsible for procuring CAM and CHP resources would be required to include the full capacity of the CAM and CHP resources in their RA plans (either the CAM units or the replacement units) and to manage the facilities as flexible RA capacity.

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	**Proposed RA Program Refinements** ➢ RA Benefits for CAM and CHP resources outside of Service Areas ➢ Schedule Outage Replacement Rule and SCP for CAM and CHP ➢ **Allocating Flexible Capacity Associated with CAM Resources** ➢ Local RA Proposals

Process for Allocating Committed Flexible Capacity Associated with CAM Resources

Background:

- D.06-07-029 adopted a cost allocation methodology, stating that, " The LSEs in the IOUs' service territory will be allocated rights to the capacity that can be applied toward each LSE's resource adequacy (RA) requirements. The LSEs' customers receiving the benefit of this additional capacity pay only for the net cost of this capacity, determined as a net of the total cost of the contract minus the energy revenues associated with dispatch of the contract."
- CAM resources may also be eligible for flexible RA capacity benefits; however, there is currently no allocation methodology for this flexible RA CAM benefit.
- Staff currently allocates local and system RA benefits of CAM resources initially in July and then again in September. Local benefits of CAM resources are subtracted off the local requirement of the local area in which the CAM resource is located. System benefits are given as a "South" or "North" CAM credit that is used towards meeting system RA requirements. To account for load migration, there is an established monthly reallocation process for the system CAM benefits and a local true up process for local CAM benefits.

Process for Allocating Committed Flexible Capacity Associated with CAM Resources

Staff Proposal:

- Staff proposes that the same allocation methodology currently used for the allocation of local RA CAM benefits be extended to the allocation of flexible RA CAM benefits. However, rather than allocating the flexible benefits four times per year, staff propose to allocate the benefits only for the initial and final year-ahead allocations.
- Staff will subtract the committed EFC of each CAM resource from the monthly flexible RA requirements consistent with the TAC area ratios. Therefore, only LSEs paying for the CAM resource will receive the flexible RA benefit.
- In order to ensure accurate allocation of flexible RA capacity to all benefiting customers, the IOUs will need to provide Energy Division with a complete list of all their committed flexible CAM resources prior to the July RA allocations. The EFC associated with each eligible flexible resource will be allocated to the TAC area paying for the resource.

Agenda

10:00 – 10:10	Introductions and announcements
10:10 – 11:20	Effective Load Carrying Capability for Wind and Solar Resources
11:20 – 12:20	Qualifying Capacity and Effective Flexible Capacity for Storage and DR
12:20 – 2:00	**Proposed RA Program Refinements** ➢ RA Benefits for CAM and CHP resources outside of Service Areas ➢ Schedule Outage Replacement Rule and SCP for CAM and CHP ➢ Allocating Flexible Capacity Associated with CAM Resources ➢ **Local RA Proposals**

Local RA Proposals

- Aggregation of Local Areas by Service Area
- Timing of Incremental Local RA Adjustments
- Quarterly CAM-RMR Allocations

Aggregation of Local Areas by Service Area

- **Background**

- D.06-06-064 aggregated 5 of the 6 Local Areas in PG&E's service territory. Other Local Areas remained separate. D.11-06-022 made that aggregation permanent.
- LSEs (utilities, ESPs, CCAs) come in all sizes, and sometimes receive small Local RA obligations. There is significant transaction costs to procuring RA capacity.
- Aggregation of Local RA obligations may increase the risk of inefficient or ineffective Local RA procurement. This risk is reduced if aggregation is limited to small amounts however

- **Proposal**

In an effort to reduce transaction costs for small LSEs, and avoid creating unnecessary reliability risk, Energy Division proposes to aggregate Local RA obligations by TAC Areas, but only for LSEs with Local RA obligations that do not exceed 5 MW in a TAC Area

Timing of Incremental Local RA Adjustments

- **Background**

- D.10-12-038 adopted a process whereby LSEs would be given adjustments to their Local RA obligations twice during the RA compliance year, adjusting each LSE's Local RA obligations reflecting customer migration. These adjustments were made due to partial reopening of direct access between 2011 and 2013.
- There was significant new direct access load that departed from utility service during that time, but the pace of migration has slowed considerably and the "tranches" of new customer migration ended in 2013.
- Despite efforts to simplify the process, the process remains time consuming and confusing for both LSEs and Commission staff.
- Staff allocate Local RA obligations once in July before the compliance year and reallocate due to adjusted forecasts of customer migration in September, also before the compliance year. Currently Local RA adjustments are made twice during the compliance year, once in February and once in May.

Timing of Incremental Local RA Adjustments

- **Energy Division Staff Proposal**

In an effort to reduce confusion and simplify the process further, Commission staff proposes to eliminate one of the two adjustment cycles, and only adjust Local RA obligations once during the compliance year (in addition to the initial allocation and reallocation before the compliance year).

Quarterly CAM/RMR Allocations

- **Background**

- D.09-06-028 ordered Commission staff to allocate CAM and RMR capacity on a monthly basis once there was more than one CAM eligible contract in a particular service territory; there is now several CAM eligible contracts in SCE service territory, and several CHP contracts in PG&E service territory that are allocated similarly to CAM.
- There was significant new direct access load that departed from utility service during between 2011 and 2013, but the pace of migration has slowed considerably and the “tranches” of new customer migration ended in 2013.
- New resources that are CAM eligible have all come online and no further additions are expected for the near future.

- **Proposal**

Energy Division proposes to decrease the frequency of CAM and RMR reallocations, from monthly to quarterly.

Thank you!

For Additional Information:

www.cpuc.ca.gov

(Search: Resource Adequacy History)